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TRENCH SILOS IN MINNESOTA

BY

Andrew Boss, Division of Agronomy and Farm Management and H. B. White and A. J. Schwantes, Division of Agricultural Engineering

Within the last few years trench silos have been used to some extent in the Northwest. Farmers who have used them in emergencies are for the most part well pleased with the results. While they are not

Fig. 1. A Trench Silo at Feeding Time

so permanent, convenient, or desirable as the upright silos, they can often be used to advantage in preserving and storing coarse feed products. It has been amply demonstrated that corn, sunflowers, and some legume crops can be preserved as successfully in trench silos as in pit or upright silos.

The trench silo when constructed in firm well-drained soil will last for several years. Greater lasting qualities may be gained by protecting the top by a collar of cement or wood. In most instances, however, they should be looked upon as temporary structures, preceding the construction of one of the more permanent types of silos.

ADVANTAGES OF THE TRENCH SILO

Some of the advantages of the trench silo are:

1. It can be constructed with very little cash outlay for material or skilled labor.
2. It can be filled with greater ease and less power machinery and expense than an upright silo.
3. Horses or other animals can be used to tramp the silage.
4. The trench is frost proof, fire proof, and wind proof.
5. With the combined corn harvester and field silage cutter no machinery for elevating the cut silage is required at the pit.
6. It needs no roof, only a covering of wet straw or green hay.
7. In years when the corn crop is so badly frosted that it will not mature it can best be preserved by ensiling. The use of trench silos in such emergencies when additional silo space is necessary will make it possible to save much more of the corn.

DISADVANTAGES OF THE TRENCH SILO

That there are disadvantages as well as advantages with the trench silo cannot be successfully contradicted. Some of them are:

1. Unsightliness in the farmstead. (This can be avoided to some extent by care in disposing of the earth and by protecting the edges.)
2. Crumbling walls and short life unless protected with cement edges and sides.
3. Destruction by floods or running water unless protected by natural or tile drainage.
4. Exposure in feeding when not possible to construct adjacent to the barns.
5. If cement edges or collars are provided and cement floors with permanent walls and roof the cost will be as great as for other types of masonry silos.
6. Trouble, labor, and expense of feeding if silo is some distance from barns or livestock.

HOW TO CONSTRUCT A TRENCH SILO

Location

A trench silo should be located only after careful consideration of the drainage, soil, and feeding convenience.

The drainage of the site for a trench silo is very important. Soil water coming into the silo will make it impossible to keep the silage. Surface water can be drained away by proper grading at the time the silo is constructed. Rain that falls on the straw roof should run off and away, in order that the silo be as dry as possible in the bottom.

A trench silo is most easily kept in repair in a clay soil which will maintain the slope of the sides without caving or washing down. A clay soil is also compact and prevents the air from coming in contact with and spoiling the silage. It is desirable that the soil remain as excavated, so that only a small amount of smoothing with a spade will prepare the walls for another year's use. A slope of three inches in each foot of depth will give a wall that is easily maintained in most clay soils.

The location of the silo should be convenient for excavating, filling, and feeding. The silo is usually large and should have plenty of space around it for working with a team and explosives, if used, while excavating. At filling time there should be plenty of room for the cutter and engine with space for driving up with heavy loads of corn. If stock is to be fed in the barn, it is usually desirable for convenience to have one end of the silo near the barn. In many cases the trench is used in addition to an upright silo, and the silage is then fed in bunks in a sheltered part of the grove or under sheds. Many clever arrangements and devices for removal of the silage can be worked out to meet the conditions in different cases. In certain cases a door into the feed alley may be constructed with a covered entrance into the silo.

Size of Silo

In trench silos the depth does not result in as compact silage as in upright silos, so that a weight of 25 pounds per cubic foot is considered the average weight.

Under ordinary conditions a depth of 8 feet is desirable and the width should be about 14 feet at the top and 10 feet at the bottom. This gives an average width of 12 feet and an area of 96 square feet in cross-section. The length may vary to meet different sized herds. With a daily ration of 40 pounds per cow and a feeding season of 183 days, there is required 7320 pounds of silage. A cubic foot weighs about 25 pounds, so 7320 pounds occupies 293 cubic feet. An ordinary trench silo with a cross-section area of 96 square feet will need to be 3 feet long to furnish silage for each mature cow. A herd of 15 cows

will require a silo 45 feet long. Other sizes may be estimated for different lengths of season and rations by substituting the proper figures in place of those used in the foregoing example.

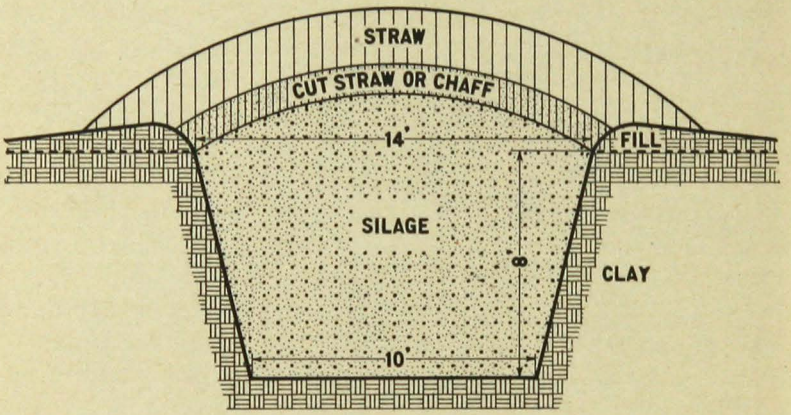

Figure 2. Cross-Section of Trench Silo

Construction

After the location has been determined, a line should be stretched along each side of the proposed silo, and the boundary marked by making a small groove with a spade.

Allow the walls to slope one foot for every four feet of depth. This amount of slope is desirable for three reasons. (1) The silo is more easily maintained; (2) tramping with horses is more satisfactory as it allows them to walk near the side; and (3) the silage as it settles is wedged in more compactly.

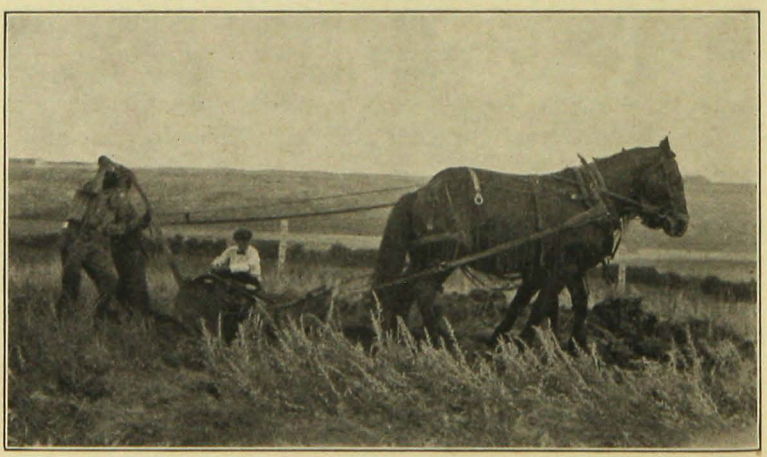

Fig. 3. Starting the Excavating for a Trench Silo

The dirt is usually loosened with a plow and removed with a scraper. Sometimes explosives can be used to advantage if not too close to buildings, making possible a considerable saving in time and under some conditions a saving in cost. When the soil is heavy and moist, explosives will be of considerable help in throwing dirt out of the trench as well as to loosen it preparatory to scraping. Where the soil is dry and hard, the principal advantage will be to loosen the earth for the scraper, but very little will be thrown out. In the lighter soils, there will usually be no advantage in using explosives.

Where explosives are used, the electrical method of firing is best. This makes it possible to fire all at one time a row of charges set along the middle of the proposed trench (Fig. 4). Holes are usually made about 2 inches in diameter, about 3½ feet deep, and about 4 or 4½ feet apart. While the size of the charge will vary considerably with conditions, under ordinary circumstances about 8 sticks of 40 per cent dynamite or its equivalent should be placed in each hole. The usual precautions for handling explosives should be observed.

Fig. 4. Trench Silo Partly Excavated; Setting a Second Row of Charges

Some hard work will be necessary to keep the sides straight and smooth as the excavating progresses. Before the silo gets too deep, the teams with scrapers can be driven lengthwise through the trench, thus saving considerable turning. When the trench gets to be about 5 or 6 feet deep in the middle, it will be desirable to definitely locate one end and cut the end wall to the desired slope. It will then be necessary to turn the team around in the trench. After the last slope

becomes too steep, the excavating may be done with the scraper on the end of a long chain. If the silo can be located on a side hill so that the opening into one end can be level with the trench floor, both excavating and removal of silage may be made easier.

Where the location is comparatively level, it is usually desirable to use most or all of the dirt which is taken out to build up a slope away from the silo on all sides to prevent surface water from running in.

It is necessary to construct a support on one side of the silo to hold the chute at filling time. This can be done by setting two poles into the ground with a crosspiece at the top. When filling, the silage should be heaped several feet above the ground level. This will allow for settling and will also serve as a roof support. It is advisable to put on a thick covering of wet straw or chaff after filling. If necessary poles may be used to keep the straw from being blown away.

Every year before filling time it will be necessary to repair the silo by resmoothing the walls and removing the loose dirt which will have accumulated.

Fig. 5. A Trench Silo after a Year's Use

Cost of Construction

One of the desirable features of the trench silo is its low cost. Any farmer can build one with practically no cash outlay. While 2 men and a team can do the work very satisfactorily, 2 teams and 5 or 6 men make a good sized crew for this purpose; thereby using the hand labor to better advantage. This crew should dig an ordinary silo in about 2 or 3 days. Where explosives can be used to advantage, this time can be shortened considerably. By using pyrotol the cost of explosive materials should not run over $7 or $8 for a 60-foot silo.

Permanence

Altho the trench silo is not so permanent as an upright silo built of masonry, it can be used several years if in soil that does not cave easily, and if given attention each year before filling to see that the sides are smooth. Usually the size is increased a little by this process, but this is not serious. In a few cases concrete walls and floors have been made and a framed building or roof used to cover the silo. However, it is doubtful whether such construction is advisable. If permanent construction of concrete is desired, it will usually be more satisfactory to build an upright silo. One advantage of the trench silo is that it cannot be blown down.

The trench silo is not conspicious from a distance as is an upright one, but it requires more ground space and usually considerable space around it, which is not easily kept neat. A location to the rear or side of the barn does not cause it to detract from the appearance of the farmstead if it is properly made and maintained.

Convenience

The ease with which a trench silo may be filled is one of its important advantages. If the corn is cut with a combined harvester with a silage cutter attachment, the load may be dropped into the trench without any special or expensive machinery. A horse or team may be used to do the packing of the silage, thus securing a very compact mass that will keep well. As the silage in a trench silo does not freeze, it can be removed very easily either in a basket or a feed carrier. The silage should be taken off each day in slices just as bread is cut from a loaf. In some cases a manger may be built along the side of the silo and the silage fed with very little labor. If the silo is some distance from the feed lot or barn, a horse-drawn box on skids will supply an ordinary herd.